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A NEW SUBSPECIES OF *CYNOPTERUS SPHINX*
(CHIROPTERA: PTEROPODIDAE) FROM SERASAN
(SOUTH NATUNA) ISLAND, INDONESIA

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While examining *Cynopterus* material in the collections of the National Museum of Natural History, I became aware that five specimens from Serasan (South Natuna) Island, Indonesia, which were classified as *C. brachyotis angulatus* Miller, were markedly different from that subspecies, and from other named *Cynopterus*, and constituted a previously unrecognized form. This paper describes the Serasan Island specimens and names them as a new subspecies of *Cynopterus sphinx* Vahl.

The first specimens of *Cynopterus* from Serasan Island were reported by Thomas and Hartert (1894), who assigned four skins, collected by E. Everett, to *Cynopterus marginatus* Geoffroy, 1810 (type locality: Bengal), now considered a synonym of *C. sphinx sphinx* Vahl, 1797. Matschie (1899) placed the Serasan Island *C. marginatus* of Thomas and Hartert, 1894, in the synonymy of *C. montani* Robin (= *C. montanoi* Robin, 1881, type locality: Malacca). Miller (1901: 137) examined five specimens from Serasan Island, and followed Matschie in considering them to be *C. montanoi* Robin.

Andersen (1912) placed *C. montanoi* Robin in the synonymy of *C. brachyotis brachyotis* D. Müller, 1838, the range of which he described as: "Borneo (probably including the Natuna Islands), extending northward over the whole of the Philippines, east to Celebes, southwest and west to Sumatra (including Banka and Biliton), the Rhio-Linga Archipelago, Malay Peninsula, and lower Siam (Trong)," and with type locality: "'eene

diepe kalksteen-spelonk, aan den oever van de rivier Dewej' South Central Borneo." He listed the Serasan Island *C. montanoi* of Miller, 1901, in the synonymy of *C. brachyotis brachyotis* but the Serasan Island *C. marginatus* of Thomas and Hartert, 1894, and the Serasan Island *C. montani* of Matschie, 1899, were placed in the synonymy of *C. brachyotis angulatus* Miller, 1898. However, he listed two skulls from Serasan Island among specimens of *C. b. angulatus* examined, and thus undoubtedly felt that Serasan Island *Cynopterus* were referable to *C. b. angulatus*. Chasen (1940) also placed the Natuna Islands within the range of *C. b. angulatus*.

The reason that the Serasan Island *Cynopterus* was not recognized earlier as being a distinct form seems to have been a lack of comparative material. Where there were sufficient specimens from Serasan Island to make an appraisal of their affinities, there was insufficient comparative material from elsewhere; where there was sufficient material from adjacent areas, workers had only a few specimens from Serasan Island for comparison. Thus, Thomas and Hartert had only four skins from Serasan Island; Matschie apparently worked from the literature, at least with regard to the Serasan Island specimens; Miller, who had a sufficient number of Serasan Island specimens, had only a skin and two bleached alcoholics from Singapore, which he thought represented *C. montanoi*, for comparative purposes (he did, however, distinguish the Serasan Island specimens from *C. angulatus* which he had named in 1898); Andersen listed only two specimens from Serasan Island that he examined; and Chasen apparently did not examine any Serasan Island *Cynopterus*, but merely followed Andersen in including the island within the range of *C. b. angulatus*.

Before proposing a name for the Serasan Island population, a note is necessary concerning the present taxonomic status of several species within the genus *Cynopterus*. The genus is generally considered to be comprised of two sections distinguishable on the basis of dental details. The "Niadius" section (*C. horsfieldi* and *C. harpax*) is characterized by the presence to some degree of a surface cusp on lower M1 and P4, and by shorter, broader, more subrectangular or subquadrate cheek teeth. The "Cynopterus" section lacks entirely the surface

cuspid on lower M1 and P4, and has longer narrower cheek teeth. The Serasan Island specimens lack any trace of a surface cusp on M1 and P4, and obviously belong to the "Cynopterus" section of the genus, of which two species are currently recognized in the literature: *C. sphinx* and *C. brachyotis*. Ellerman and Morrison-Scott (1951: 98-99) gave the approximate distribution of these species as: *C. sphinx*: Hainan, peninsular India, Ceylon, Bengal, Kumaon, Sikkim, Bhutan Duars, Burma, Indo-China, Siam, and on the islands of Sumatra, Java, Bali, Lombok, and Timor. *C. brachyotis*: southern China, Ceylon, Andaman and Nicobar Islands, Tenasserim, Burma, Assam, Siam, Malay States, Sumatra, Java, Borneo, and adjacent small islands, Celebes, and Philippine Islands. The range of the subspecies *C. b. angulatus* was given as: Kindat (Chindwin), western Burma, Tenasserim, Siam (Nan, Bangkok, Chiangmai, etc.), Cambodia, and Annam, Natuna Islands, Anamba Islands, and various small islands off the coast of Siam.

Mr. John Edwards Hill of the British Museum (Natural History) and Mr. Kitti Thonglongya of the Applied Scientific Research Corporation of Thailand, have recently completed a study (in press) of the genus *Cynopterus* in Thailand, and Mr. Hill has kindly given me permission to cite some of their conclusions regarding *C. sphinx* and *C. brachyotis* that affect the nomenclature used in the present paper. Mr. Hill stated (personal communication): "It is only recently . . . that specimens from the critical area of southern Thailand have come to hand. These have led to the conclusion that although two species are involved, as Andersen thought (*C. sphinx* and *C. brachyotis*), the form *angulatus* is not a subspecies of *C. brachyotis* as Andersen considered, but instead of *C. sphinx* . . . The two species can be separated as a rule by the combination of two parameters, the length of the forearm and the length of the ear. In *C. sphinx* the forearm generally exceeds 65 mm in length and the ear 19.0 mm; specimens of *C. brachyotis* have forearm and ear lengths rarely exceeding these values."

Since the forearms of the Serasan Island specimens are within the size limits of *C. sphinx* rather than *C. brachyotis*, and the ears appear large, comparable to those in *sphinx*, and

larger than in *brachyotis*, I consider them to represent a race of *C. sphinx*. This race may be known as:

***Cynopterus sphinx serasani* new subspecies**

1894. *Cynopterus marginatus*: Thomas and Hartert, First Glimpses of the Zoology of the Natuna Islands. III. List of the first collection of mammals from the Natuna Islands. *Novitates Zoologicae*, Vol. 1, p. 655.

1899. *Cynopterus montani* (part): Matschie, Die Megachiroptera des Berliner Museums für Naturkunde, p. 75, August.

1901. *Cynopterus montanoi*: Miller, Mammals collected by Dr. W. L. Abbott on the Natuna Islands, *Proc. Washington Acad. Sci.*, Vol. III, p. 137, March 26.

1912. *Cynopterus brachyotis angulatus* (part): Andersen. Catalogue of the Chiroptera in the collection of the British Museum, p. 614.

Holotype: U.S. Nat. Mus. no. 104744, adult male, skin and skull, collected June 10, 1900, by W. L. Abbott, on Serasan Island, Natuna Islands, Indonesia.

Measurements of holotype (in mm): Forearm, 72.0; greatest length of skull, 30.9; interorbital breadth, 6.9; condylobasal length, 29.5; zygomatic breadth, 20.0; palatal length (from posterior margin of right palatine foramen to end of palate), 13.6; width across crowns of M1 (externally), 8.8; length of maxillary toothrow (from anterior edge of alveolus of canine to posterior edge of alveolus of M1), 10.1; maximum breadth of braincase, 12.7.

Measurements of topotypes: Forearm, 73.3 (dry skin), 65.2 (dry skin), 71.3 (alcoholic), 72.3 (alcoholic); greatest length of skull, 30.2, 29.8, 30.9, 30.1; interorbital breadth, 7.0, 6.5, 6.8, 6.5; condylobasal length, 28.8, 27.9, 29.5, —; zygomatic breadth, 19.8, 19.5, 19.5, —; palatal length, 14.4, 13.6, 13.6, 13.2; width across crowns of M1 (externally), 8.8, 8.4, 8.9, 9.3; length of maxillary toothrow, 9.5, 9.8, 10.0, 10.2; maximum breadth of braincase, 12.3, 12.2, 12.5, —.

Richard C. Banks kindly took some measurements for me of the two specimens from Serasan Island in the British Museum (Natural History). These specimens measure cranially as follows: Greatest length of skull, 31.4, 29.8; zygomatic breadth, 20.1, 19.5; interorbital breadth, 6.7, 6.5; breadth of braincase, 12.3, 12.6. John Edwards Hill informs me that the forearm length of these specimens is 69.3 and 68.6, respectively. Their ear lengths are 19.7 and 18.3.

Distribution: At present known only from Serasan Island, Natuna Islands, Indonesia.

Comparisons: *C. s. serasani* differs from all races of *C. brachyotis* in its larger size. Externally this is evident in the length of the forearm: *C. brachyotis* has a forearm length generally under 65 mm in length. As can be seen in the measurements section, all specimens from Serasan Island have forearm measurements considerably in excess of 65.0 mm. In addition to the longer forearm, Serasan Island specimens have larger

TABLE 1. Mean, extremes and sample size of *C. s. serasani* and Bornean specimens of *C. b. brachyotis* for greatest length of skull and zygomatic breadth.

	Greatest Length of Skull	Zygomatic Breadth
<i>C. s. serasani</i>	30.4(29.8-31.4), N = 7	19.7(19.5-20.1), N = 6
<i>C. b. brachyotis</i>	28.5(27.5-29.7), N = 48	18.4(17.0-19.8), N = 53

ears than any race of *brachyotis*. The size difference is difficult to demonstrate in cold figures, but is evident on comparison of specimens. In both forearm length and ear size, *C. s. serasani* shows a close approach to *C. s. angulatus*.

Cranially, *C. s. serasani* differs from all races of *C. brachyotis* in large size; relatively as well as actually broader interorbital region; greater development of frontal sinuses; more strongly marked development of postorbital process of frontals; M1 decidedly smaller than P4 (equal to or only slightly smaller in *brachyotis*); palate longer and relatively narrower. In Table 1, *C. s. serasani* is compared with *C. b. brachyotis* (which occurs on the island of Borneo less than 50 miles distant) for greatest length of skull and zygomatic breadth to illustrate the much larger cranial size of *serasani*.

C. s. serasani differs from all races of *C. sphinx* (except *C. s. angulatus*) in being distinctly smaller. Andersen (1912: 600, 629) gives the range of measurements of greatest length of skull and forearm respectively for the races of *C. sphinx* as follows: *C. s. sphinx* 31.5-34.5, 66.0-73.5; *C. s. gangeticus* 33.0-36.0, 73.0-78.0; *C. s. titthaecheilus* 35.5-38.5, 74.5-83.0; *C. s. major* (which Andersen regarded as a full species) 34.0-35.8, 75.6-82.0.

Cynopterus s. serasani is about the same size cranially and externally as *C. s. angulatus* but differs in the following cranial details: Much broader interorbital region, with greater development of frontal sinuses; greater development of postorbital process of frontals; braincase narrower, less inflated; palate narrower with cheek teeth smaller; M1 decidedly smaller than P4 (equal to or only slightly small in *angulatus*). In Table 2, *C. s. serasani* is compared with *C. s. angulatus* (specimens from Thailand, Cambodia, and South Vietnam) for interorbital breadth, width of braincase and palatal breadth.

Coloration: As noted by Andersen (1912: 592) coloration in *Cynopterus* is variable and apparently of only slight taxonomic value. The Serasan skins available to me are quite dark in coloration, considerably darker than most *C. brachyotis* that I have examined. Probably the only race of *C. brachyotis* that compares with *serasani* is *C. b. altitudinus* Hill, a very dark montane race from the highlands of Malaya, specimens of which I have not examined. Specimens of *serasani* resemble *C. s. angulatus* in coloration, but are even darker than most representatives of that

TABLE 2. Mean, extremes and sample size of *C. s. serasani* and South Vietnamese, Thai and Cambodian *C. s. angulatus* for interorbital breadth, breadth of braincase and palatal width.

	Interorbital Breadth	Breadth of Braincase	Palatal Width (across M1-M1, crown)
<i>C. s. serasani</i>	6.7(6.5-7.0), N = 7	12.4(12.2-12.7), N = 6	8.8(8.4- 9.3), N = 5
<i>C. s. angulatus</i>			
South Vietnam	5.9(5.3-6.5), N = 59	13.7(12.7-14.5), N = 58	9.5(9.1-10.0), N = 59
Thailand	5.9(5.4-6.4), N = 19	13.3(12.9-13.7), N = 19	9.5(9.1-10.0), N = 18
Cambodia	5.7(5.4-6.1), N = 4	13.3(13.1-13.6), N = 4	9.1(8.9- 9.5), N = 4

form. The three dry skins from Serasan Island in the National Museum of Natural History collections have pronouncedly dark (almost black) heads, and seem to differ in this respect from all *C. brachyotis* and *C. s. angulatus* that I have examined. In the latter two forms, the coloration of the head does not differ markedly from the coloration of the back. Larger series will be necessary to determine whether these differences in coloration have any taxonomic significance.

Specimens examined: *C. brachyotis babi*, INDONESIA—Sumatra: Babi Island, 2 (one the type). *C. brachyotis brachyotis*, INDONESIA—Kalimantan: Batudjuring, 1; Kendawangan River, 1; Klumpeng Bay, 1; Landak River, 2; Mahakan River, 16; Mankol, 4; Pari, 2; Sangau, 1; Segah River, 15; Simpang River, 3. Sumatra: Bangka Island, 4; Belitung Island, 6; Bengkalis Island, 3; Bulan Island, 1; Dumai, 2; Kepahiang, 2; Kindur Island, 2; Makapan Island, 1; Mandau River, 9; Merbau Island, 1; Pini Island, 3; Setoko Island, 2; Sugi Island, 6; Tapanuli Bay, 9; Tarusan Bay, 2. MALAYSIA—Malaya: Kuala Lumpur, 16 mi. N, 1; Siribuat Island, 1. Sebah: Jesselton area, 32; Mt. Kinabalu, 4. SINGAPORE—4. THAILAND—Khlum Island, 2; Kut Island, 1. *C. brachyotis insularis*, INDONESIA—Kalimantan: Matisiri Island, 2. *C. brachyotis javanicus*, INDONESIA—Java: no exact locality, 3; Bogor, 6; Depok, 1. *C. brachyotis minutus*, INDONESIA—Sumatra: Nias Island, 1 (the type). *C. brachyotis pagensis*, INDONESIA—Sumatra: North Pagi Island, 2 (one the type). *C. brachyotis scherzeri*, INDIA—Car Nicobar Island, 1. *C. harpax*, MALAYSIA—Malaya: Kuala Lumpur, 16 mi. N, 1. *C. horsfieldi lyoni*, INDONESIA—Sumatra: Atjeh Melowak, 1; Siak River, 1 (the type of *Niadias minor*, Lyon). *C. horsfieldi princeps*, INDONESIA—Sumatra: Nias Island, 3 (one the type). *C. sphinx angulatus*, CAMBODIA—Demrey Phong, 2 km. SE, 9; Sipora Island, 1. CHINA—Hainan Island, 1. INDONESIA—Sumatra: Kepachiang, 2; Lahat, 1; Siberut Island, 2; Sipora Island, 1. MALAYSIA—Malaya: Johore, Jambu Luang, 1. SOUTH VIETNAM—An Khe Military Base, 4; Blao, 4 km. W, 1; Caryu Danar, 1; Cau Da, 8; Dak Sut, 5; Da Nang (vicinity), 3; Fyan, 2; Me Thout, 7 km. NW, 1; Mt. Son Tra (vicinity), 13; Polei Kleng, 5; Xuan Phu, 2 km. S, 15. THAILAND—Bangkok, 7; Ban Tha Din Daeng, 1; Chang Island, 1; Chiang Saen, 1; Chiang Mai, 1; Kaulak, 2; Nakon Pathom, 3; Nakhon Sawan, 1; Pakphayun District (no exact locality), 1; Rat Buri, 3; Trong, 7. *C. sphinx major*, INDONESIA—Sumatra: Nias, 5 (one the type). *C. sphinx serasani*, INDONESIA—Serasan Island (including two at the British Museum [Nat. Hist.] examined for me by John Edwards Hill and Richard C. Banks), 7. *C. sphinx sphinx*, BURMA—Myithyina, 1. INDIA—Coimbatore, 3. *C. sphinx titlaecheilus*, INDONESIA—Java: western Java (no exact locality), 31; Banten, 1; Bagor, 7.

All specimens examined are in the collection of the National Museum of Natural History, unless otherwise noted.

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